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ALIEN PROPERTY CUSTODIAN

MANUFACTURE OF ENAMELS

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Enamels having a very high covering power, known as super-opaque enamels, have already been manufactured. Such enamels when applied to a black body in a layer of about 350 grs. per sq. m. provide surfaces which diffuse light to the extent of 70–75%.

Hitherto, it has been possible to obtain such enamels only by adding to each grinding mixture considerable quantities, for example 8–16%, of an ordinary opacifying agent (tin oxide, zirconium oxide, antimoniates etc.) to the frits (granular material) already rendered very opaque on fusion by considerable quantities of antimony compounds. On analysis, said granular material or frits usually show Sb_2O_5 contents of 11–13%.

Hitherto it has been impossible to obtain such enamels with a very high covering power free from antimony since in the best frits free from this opacifying agent it has been necessary to add to the grinding mixture 15–20% or more of ordinary opacifying agents (tin oxide, zirconium oxide, antimoniates, etc.) in order to obtain the opacity and covering power indicated above.

Under these conditions the enamel became hard and porous. Its resistance to friction was greatly endangered and its brilliancy very much reduced to the point of being no longer appreciable. In short, the enamel lost a part of its principal properties.

We have found that if quantities of cerium oxide of from 4–7% are added to a good frit which is capable of properly developing said opacifying agent, that is to say, one which is sufficiently aluminous, and if care is taken properly to disperse said opacifying agent by means of a prolonged grinding operation, the enamel obtained, when applied to a black body in a layer of 350 grs. per sq. m., easily provides surfaces which diffuse light to the extent of 72–75%. This enamel possesses besides a high covering power a remarkable brilliance and the cerium oxide improves its principal properties and physical qualities.

The present invention consists in a process for the manufacture of very opaque enamels consisting in grinding the frit, an opacifying agent or a mixture of opacifying agents containing cerium oxide and clay, to a high degree of dispersion; preferably the grinding will be carried out so that a mixture containing the cerium oxide and the frit, passes through a 325 sieve with not substantially more than 1% retained on the sieve, this mixture being capable of use directly or after the addition of less finely ground mixtures.

Grinding can be carried out more particularly according to the following two methods:

1—The frit plus the opacifying agents and clay may be ground very finely so that the whole passes through a 325 sieve, not more than 1% being retained on the sieve; or

2—25–50% of the frit may be ground very finely with the cerium oxide and the clay so that the whole passes through a 325 sieve, none of the mixture or at the most 1% being retained on the sieve. The remainder of the frit, namely 75–50% and the necessary water are then added and the whole is then ground according to the usual methods so that it passes through a 200 sieve with a maximum of 1–2% retained on the sieve.

This second method gives enamels which can be applied without difficulty and without special precautions like ordinary enamels, while the first method requires a few particular precautions during application.

Our process has the advantage of permitting:

(*a*) the production of super-opaque enamels by the simple of cerium oxide to the grinding mixture;

(*b*) the production of super-opaque enamels with frits which may be those usually employed in ordinary enamels in which cerium oxide is used as an opacifying agent, provided the frits properly develop the opacity of these substances;

(*c*) the production of super-opaque enamels using transparent frits or frits which have only been previously rendered opaque by fluorides to the exclusion of compounds of antimony;

(*d*) the production of super-opaque enamels which are free from antimony and which are consequently non-toxic and capable of use for enamelling domestic articles;

(*e*) the production of very brilliant non-porous super-opaque enamels which have a high resistance to friction;

(*f*) the production of enamels for domestic articles which enamels can be used in very thin layers and which therefore have a very high resistance to thermal shocks due to sudden changes of temperature.

By way of example and in order to facilitate the understanding of the description we explain below one way in which the invention can be carried out in practice:

The frit is first prepared using one of the following compositions A, B or C or a similar frit; all frits which are capable of properly developing the opacifying properties of cerium oxide can likewise be used without inconvenience. Frits

rendered opaque by one or more fluorides are particularly suitable:

	A	B	C
Feldspar	350	300	460
Quartz	60	100	50
Kaolin	125	130	100
Ordinary borax	210	210	220
Sodium carbonate	70	65	100
Sodium fluosilicate	125	130	100
Fluorspar			40
Magnesia	10	10	15
Sodium nitrate	50	40	20
Ground zircon	25	30	40

The grinding of said frit with cerium oxide to which, if desired, other opacifying agents may have been added, is then carried out. When cerium oxide is used as the only opacifying agent the proportions are 4–7% of the total weight of the mixture constituting the enamel, the proportion of 6% giving good results. When it is used together with other opacifying agents such as zirconium oxide, oxide of tin or antimoniates, the proportion of cerium oxide may be lowered to 3%.

The following examples of grinding mixtures have given good-results:

No. 1 grinding

Frit A or other frits		100
Clay		6
Cerium oxide		6 (4–7)
Magnesium carbonate		0. 3–0. 5
Water	cc.	60

The whole is ground until a maximum of 1% is retained on a 325 sieve.

No. 2 grinding

Frit A or other frit		35
Clay		6
Cerium oxide		6 (4–7)
Magnesium carbonate		0. 3–0. 5
Water	cc.	30

The whole is ground until it passes completely through a 325 sieve.

Then add to the previous grinding:

Frit A or other frit		65
Water	cc.	30

Grind until a maximum of 2% is retained on a 200 sieve.

No. 3 grinding

Frit A or other frit		35
Clay		6
Cerium oxide		3–5
Zirconium oxide		5–8
Magnesium carbonate		0. 3–0. 5
Water	cc.	30

The whole is ground until it completely passes through a 325 sieve.

Then add to the previous grinding:

Frit A or other frit		65
Water	cc.	30

Grind until 2% at the most is retained on a 200 sieve.

When applied to ordinary black articles in layers of 350 grs. per sq. m. these enamels yield very brilliant and very white surfaces which diffuse light to the extent of 72–74%.

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MAXIME × PAQUET.
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